

Attorney Docket No. P11323

**AMENDMENTS TO THE CLAIMS**

The listing of claims will replace all prior versions, and listings, of claims in the application:

**Listing of Claims**

1. (Currently Amended) A method of improving speech quality in a communication system comprising a first terminal unit (TRX1), which transmits speech signals having a first sampling frequency (F1) and a second terminal (TRX2), which receives the speech signals, the method performed at the second terminal and comprising:

~~transmitting speech signals having a first sampling frequency (F<sub>1</sub>);~~

receiving said speech signals;

decoding the received speech frame;

Cl buffering said decoded speech signals frame in a playout buffer ~~with said first frequency (F<sub>1</sub>) of said second terminal (TRX2);~~

~~playing out said speech signals with a second frequency (F<sub>2</sub>);~~

performing a dynamic sample rate conversion of [[a]] said decoded speech frame comprising N samples on a sample by sample basis, said dynamic sample rate conversion comprising:

creating [[an]] a first LPC-residual excitation frame comprising N samples derived from said decoded speech frame;

calculating ~~for each speech frame~~, whether a sample should be either added or removed from said first LPC-residual excitation frame;

selecting, in response to a determination that said calculating so demands, the position where in said first LPC-residual excitation frame to add or remove a sample;

generating a second modified LPC-residual excitation frame comprising at least one of N-1 and N+1 samples, in response to a determination that said calculating so demands; and

Attorney Docket No. P11323

synthesizing, in response to a determination that said calculating so demands, a second speech frame signal from said second modified LPC-residual excitation frame; and

playing out, in response to a determination that said calculating so demands, said second speech frame from said play out buffer.

2. (Previously Presented) The method of claim 1 wherein the creating step comprises performing an LPC-analysis of the speech frame in order to find LPC-parameters of said speech frame.

C1 3. (Previously Presented) The method of claim 1 wherein the creating step comprises using already existing LPC-parameters from a speech decoder.

4. (Previously Presented) The method of claim 1 wherein the creating step comprises using an existing LPC-residual from a decoder.

5. (Previously Presented) The method of claim 1, wherein the calculating step comprises deciding whether a sample should be added or removed based on at least one of the following inputs:

sample frequencies of the sending (TRX1) and receiving (TRX2) terminal units;  
a voice activity detector signal;  
a status of the playout buffer; and  
an indicator of a beginning of a talkspurt.

6. (Currently Amended) The method of claim 1, wherein ~~the generating step comprises: selecting a position in the LPC residual at which to add or remove a sample; and adding or removing of said sample~~ said position is found by searching for a segment of said first LPC-residual excitation frame with low energy.

Attorney Docket No. P11323

7. (Currently Amended) The method of claim ~~[[6]]~~ 1 wherein ~~the step of selecting said position is performed arbitrarily~~ said second second terminal unit uses a second sampling frequency (F2) which is a different frequency than said first sampling frequency.

8. (Currently Amended) The method of claim ~~[[6]]~~ 5 ~~further comprising the step of finding said position via a search for a segment of the LPC residual with low energy~~ wherein said second second terminal unit uses a second sampling frequency (F2) which is a different frequency than said first sampling frequency.

CA 9. (Currently Amended) The method of claim ~~[[8]]~~ 6 wherein said segment of low energy is found via a block energy analysis.

10. (Currently Amended) The method of claim ~~[[8]]~~ 6 wherein said segment of low energy is found via a sliding window energy analysis.

11. (Currently Amended) The method of claim ~~[[6]]~~ 1 wherein said position is found using knowledge about a position of a pitch pulse and knowledge about a time difference between said pitch pulse and a following pitch pulse to select the position at which to add or remove a sample in the LPC-residual.

12. (Previously Presented) The method of claim 11 further comprising the step of finding said pitch pulse via a search for positions in the LPC residual with high energy.

13. (Previously Presented) The method of claim 12 wherein said positions with high energy are found via a block energy analysis.

14. (Previously Presented) The method of claim 12 wherein said positions with high energy are found via a sliding window energy analysis.

Attorney Docket No. P11323

15. (Currently Amended) The method of claim [[6]] 1 wherein said adding comprises adding a zero sample.

16. (Currently Amended) The method of claim [[6]] 1 wherein said adding comprises adding a zero sample and interpolating surrounding samples.

17. (Currently Amended) The method of claim [[6]] 1 wherein said removing comprises removing a sample from the LPC-residual.

cl 18. (Currently Amended) The method of claim [[6]] 1 wherein said adding comprises:

adding a sample in a history of the LPC residual; and  
increasing a lag pointer so long as the adding is within an LPC residual history.

19. (Currently Amended) The method of claim [[6]] 1 wherein said removing comprises:

removing a sample in a history of the LPC residual; and  
decreasing a lag pointer so long as the removing is within the LPC residual history.

20. (Currently Amended) The method of claim [[6]] 1 wherein the second terminal unit comprises an adaptive and a fixed codebook; and

wherein said adding comprises:

adding a sample in an output from the adaptive codebook;  
extending an output from the fixed codebook; and  
Increasing a lag pointer so long as the adding is within the LPC residual history.

21. (Currently Amended) The method of claim [[6]] 1 wherein the second terminal unit comprises an adaptive and a fixed codebook; and

wherein said removing comprises:

removing a sample in an output from the adaptive codebook;

shortening an output from the fixed codebook; and  
decreasing a lag pointer so long as the removing is within the LPC residual history.

22. (Currently Amended) The method of claim ~~[[6]]~~ 1 wherein the second terminal unit comprises a fixed codebook; and

wherein said adding or removing comprises adding or removing a sample in an output from the fixed codebook.

C1  
23. (Currently Amended) An apparatus for improving speech quality in a communication system comprising a first terminal unit (TRX1) ~~adapted to transmit which transmits~~ speech signals and having a first sampling frequency ( $F_1$ ) and a second terminal unit (TRX2), ~~which receives said speech signals, adapted to buffer said speech signals in a playout buffer with said first frequency ( $F_1$ ) and to play said speech signals out with a second frequency ( $F_2$ ),~~ said apparatus comprising:

means for receiving said speech signals;

means for decoding the received speech frame;

means for buffering said decoded speech frame in a playout buffer of said second terminal (TRX2);

means for performing a dynamic sample rate conversion of ~~[[a]]~~ said decoded speech frame comprising N samples on a sample by sample basis, wherein said means for performing said dynamic sample rate conversion comprises:

means for creating ~~[[an]]~~ a first LPC-residual excitation frame comprising N samples derived from said speech frame;

means for calculating ~~for each speech frame~~ whether a sample should be added or removed from first said LPC-residual excitation frame;

means for selecting, in response to a determination that said calculating so demands, the position where in said first LPC-residual excitation frame to add or remove a sample;

Attorney Docket No. P11323

means for generating a second modified LPC-residual excitation frame comprising at least one of N-1 and N+1 samples in response to a determination that said calculating so demands; and

means for synthesising a second speech frame signal from said second modified LPC-residual excitation frame in response to a determination that said calculating so demands; and

means for playing out said second speech frame from said play out buffer in response to a determination that said calculating so demands.

24. (Previously Presented) The apparatus of claim 23 wherein the means for creating comprises means for performing an LPC-analysis of the speech frame to find LPC-parameters of said speech frame.

25. (Previously Presented) The apparatus of claim 23 wherein the means for creating comprises means for using existing LPC-parameters from a speech decoder.

26. (Currently Amended) The apparatus of claim 23 wherein ~~the means for creating comprises means for using an existing LPC-residual from a decoder~~ said position is found by searching for a segment of said first LPC-residual excitation frame with low energy.

27. (Previously Presented) The apparatus of claim 23, wherein the means for calculating comprises means for deciding if a sample should be added or removed on the basis of a function of at least one of the following inputs:

- sample frequencies of sending and receiving terminal units;
- a voice activity detector signal;
- a status of the playout buffer; and
- an indicator of a beginning of a talkspurt.

28. (Canceled).

Attorney Docket No. P11323

29. (Currently Amended) The apparatus of claim ~~[[28]]~~ 23 wherein ~~the means for selecting comprises means for arbitrarily selecting said position at which to add or remove samples~~ said second second terminal unit uses a second sampling frequency (F2) which is a different frequency than said first sampling frequency.

30. (Currently Amended) The apparatus of claim ~~[[28]]~~ 27 wherein ~~the means for selecting comprises means for searching for the segment of the LPC residual with the lowest energy~~ said second second terminal unit uses a second sampling frequency (F2) which is a different frequency than said first sampling frequency.

C  
31. (Currently Amended) The apparatus of claim ~~[[30]]~~ 28 wherein the means for searching comprises means for performing a block energy analysis.

32. (Currently Amended) The apparatus of claim ~~[[30]]~~ 28 wherein the means for searching comprises means for performing a sliding window energy analysis.

33. (Currently Amended) The apparatus of claim ~~[[28]]~~ 23 wherein the means for selecting comprises means for using knowledge about a position of a pitch pulse together with knowledge about a time difference between said pitch pulse and a following pitch pulse to select the position at which to add or remove a sample in the LPC-residual.

34. (Previously Presented) The apparatus of claim 33 wherein the means for using knowledge about pitch pulses comprises means for finding the pitch pulses by searching for positions in the LPC residual with high energy.

35. (Previously Presented) The apparatus of claim 34 wherein the means for finding pitch pulses comprises means for performing a block energy analysis.

36. (Previously Presented) The apparatus of claim 34 wherein the means for finding pitch pulses comprises means for performing a sliding window energy analysis.

Amendment - PAGE 8 of 19  
EUS/JIP/04-8676

Attorney Docket No. P11323

37. (Currently Amended) The apparatus of claim ~~[[28]]~~ 23 wherein the means for performing adding or removing comprises means for adding a zero sample.

38. (Currently Amended) The apparatus of claim ~~[[28]]~~ 23 wherein the means for performing adding or removing comprises means for removing a sample from the LPC-residual.

C 39. (Currently Amended) The apparatus of claim ~~[[28]]~~ 23 wherein the means for performing adding or removing comprises means for adding a zero sample and interpolating surrounding samples.

40. (Currently Amended) The apparatus of claim ~~[[28]]~~ 23 wherein the means for performing adding or removing comprises:

means for adding a sample in a history of the LPC residual; and

means for increasing a lag pointer so long as the adding is within the LPC residual history.

41. (Currently Amended) The apparatus of claim ~~[[28]]~~ 23 wherein the means for performing adding or removing comprises:

means for removing a sample in a history of the LPC residual; and

means for decreasing a lag pointer so long as the removing is within the LPC residual history.

42. (Currently Amended) The apparatus of claim ~~[[28]]~~ 23 wherein the second terminal unit comprises:

an adaptive and a fixed codebook;

means for adding a sample in an output from the adaptive codebook;

means for extending an output from the fixed codebook; and

means for increasing a lag pointer so long as the adding is within the LPC residual history.

Amendment - PAGE 9 of 19  
EUS/JJP/04-8576



Attorney Docket No. P11323

43. (Currently Amended) The apparatus of claim ~~[[28]]~~ 23 wherein the second terminal unit comprises:

an adaptive and a fixed codebook;

means for removing a sample in an output from the adaptive codebook;

means for removing a sample in an output from the fixed codebook; and

means for decreasing a lag pointer so long as the removing is within the LPC residual history.

44. (Currently Amended) The apparatus of claim ~~[[28]]~~ 23 wherein the second terminal unit comprises:

a fixed codebook; and

means for adding or removing a sample in an output from the fixed codebook.

---